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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MARK J. HAMPDEN-SMITH, TOIVO T. KODAS,
JAMES CARUSO, and DANIEL J. SKAMSER

Appeal 2008-0540
Application 09/495,141
Technology Center 1700

Decided: February 27, 2008

Before BRADLEY R. GARRIS, CATHERINE Q. TIMM, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

1Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 12-19, 24-27, and 29-42. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

INTRODUCTION

Appellants disclose a method of depositing phosphor powders in a liquid suspension using a direct-write tool such as an ink-jet (Specification 1). The liquid suspension has a viscosity of "not greater than 30 centipoise" (claim 12).

Claims 12, 17, 18, and 19 are illustrative:

> 12. A method for depositing a phosphor pattern comprising phosphor particles on an article using a direct-write tool, comprising the steps of:
>
> providing a particulate suspension of said phosphor particles having a viscosity of not greater than 30 centipoise, wherein said phosphor particles are substantially spherical and have a weight average particle size of from about 0.1 μm to about 20 μm; and
>
> depositing said particulate suspension on said article using a direct-write tool that is controllable over an x-y grid.
>
> 17. A method as recited in Claim 19, wherein said phosphor particles have an apparent density of not greater than about 20 percent of the theoretical density of the phosphor compound.
>
> 18. A method as recited in Claim 19, wherein said phosphor particles comprise hollow particles.
>
> 19. A method as recited in Claim 12, wherein said direct-write tool is selected from one of an automated syringe and an ink-jet device.

The Examiner relies on the following prior art references as evidence of unpatentability:

Nanto	5,921,836	Jul. 13, 1999
Okumura	6,100,633	Aug. 8, 2000
Ito	6,416,174 B1	Jul. 9, 2002

The rejection as presented by the Examiner is as follows:

1. Claims 12-19, 24-27, and 29-42 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Okumura in view of Nanto and Ito.

Appellants separately argue independent claims 12, 24, 41, 42, and dependent claims 17 and 18.

OPINION

CLAIM 12

Appellants argue that there is no motivation or suggestion to modify the combination of Okumura and Nanto by manipulating the phosphor composition to be applicable for ink-jet printing as evidenced by Ito (Br. 8). Specifically, Appellants argue that Okumura and Nanto use fluorescent pastes, which have viscosities greater than 30 centipoise, such that there would be no motivation to use a lower viscosity composition as disclosed by Ito with Okumura's in view of Nanto's method (Br. 9). Appellants further argue that Ito uses the ink-jet process to form a color filter layer not a phosphorescent layer such that there is no motivation to modify Okumura's fluorescent paste to have Ito's lower viscosity (Br. 10). Appellants contend that combining a lower viscosity phosphor composition (i.e., Ito's ink composition) with Nanto's nozzle would render Nanto's deposition method

unsatisfactory for its intended purpose because Nanto uses a nozzle with an opening diameter of greater than 100 μm, such that the lower viscosity composition could not be successfully ejected through the nozzle (Br. 10).

We have considered all of Appellants' arguments and are unpersuaded for the reasons below.

With regard to the Examiner's combination of references, we view Nanto's disclosure of a direct-write tool to be cumulative to Ito's disclosure to use an ink-jet apparatus and method to deposit the ink. Appellants define "direct-write tool" as "a device that deposits a liquid or liquid suspension on to a surface by ejecting the composition through an orifice toward the surface without contacting the surface" (Specification 5). Appellants indicate that an ink-jet device constitutes a direct-write tool (Specification 5). Moreover, Appellants do not dispute the Examiner's combination of Nanto's deposition device with Okumura's method of depositing phosphor layers. Accordingly, our focus in the decision is primarily on the combination of Ito's ink-jet method with Okumura's method of depositing phosphor layers in a plasma display panel.

Okumura discloses a plasma display panel whose construction includes depositing phosphor layers 5 (Okumura, col. 3, ll. 41-45). The phosphor layers are made of phosphor particles that are substantially spherical and have an average particle size range of 0.1 to 5 μm (Okumura, col. 4, ll. 15-20). Okumura discloses that the substantially spherical particles lower the viscosity of the paste (i.e., viscosity of the paste is an important factor) (Okumura, col. 4, ll. 31-36). Okumura's paste may be screen printed, for example, onto the substrate (Okumura, col. 5, ll. 9-11).

Ito discloses an ink composition comprising a solvent, a pigment and a dispersant such that the ink has a viscosity of 1.5 centipoise to 20.0 centipoise (Ito, col. 2, ll. 17-24). The pigment preferably has a particle size of 0.5 to 50 μm and may include phosphor compounds (Ito, col. 7, ll. 34-36). Ito discloses using an ink-jet method to deposit the ink on a substrate (Ito, col. 2, ll. 54-63). Ito uses the ink composition and ink-jet method to apply a multi-color layer to a component of a plasma display so as to form a color filter (Ito, col. 2, ll. 64-67). Ito discloses that the ink-jet method easily forms a fine pattern efficiently on a surface of a display and is more economical and reliable than conventional coating processes such as a printing method (i.e., screen printing) (Ito, col. 1, ll. 66-67, col. 2, ll. 1-3, col. 11, ll. 57-67). Ito further discloses that using the ink-jet process provides advantages such as forming a multi-color pattern quickly and easily with little noise (Ito, col. 1, ll. 24-30).

Contrary to Appellants' arguments, the references provide motivation to modify Okumura's method of making a plasma display panel with a coating of phosphor microspheres by lowering the viscosity of the coating composition and using an ink-jet apparatus and method for depositing phosphor pigment onto a component of a display device (e.g., a plasma display panel or LCD) as disclosed by Ito. *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998). Specifically, Ito teaches that using a lower viscosity composition and the ink-jet device provides a phosphor coating on the display panel that is equal to a coating produced using a conventional printing method (e.g., screen printing or photolithography), except that the ink-jet method is more economical (Ito, col. 11, ll. 57-67; col. 13, ll. 59-67, col. 14, ll. 1-2).

Regarding Appellants' argument that both Okumura and Nanto use pastes such that there would be no motivation to manipulate the pastes to have Ito's lower viscosity, we note that Ito's disclosure that the ink-jet method is more economical than conventional deposition processes such as printing methods (i.e., screen printing) provides motivation to manipulate the viscosity to a lower viscosity suitable for ink-jet deposition. Okumura discloses that viscosity of the paste is lowered by the substantially spherical particles in the paste (i.e., lowering viscosity of the paste is important) (Okumura, col. 4, ll. 35-37). Accordingly, one of ordinary skill in the art would have been motivated to lower the viscosity of Okumura's paste in view of Ito's disclosure.

Furthermore, in view of Ito's and Okumura's disclosures, one of ordinary skill in the art, modifying Okumura's method of depositing phosphor materials on plasma display panels by using Ito's lower viscosity for the coating composition and the ink-jet method to apply the coating, would have tailored the viscosity of the coating composition to be suitable for the particular ink-jet deposition equipment being used. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct 1727, 1742 (2007) ("A person of ordinary skill is also a person of ordinary creativity, not an automaton.").

We are unpersuaded by Appellants' argument that there is no motivation for the Examiner's combination of Okumura in view of Ito because Ito forms a color filter layer not a phosphorescent coating. We understand Appellants to be arguing that there is no motivation for the combination because the color filter layer of Ito does not necessarily contain phosphor particles (e.g., a LCD does not contain any phosphors) (Br. 10).

However, Appellants admit that Ito discloses (Ito, col. 7, ll. 46-47) using phosphor pigments in the coating (i.e., forming a phosphorescent layer) (Br. 10). Moreover, like Okumura (Okumura, col. 3, ll. 33-35), Ito discloses using phosphor particles to form coatings on plasma display panels (Ito, col. 8, ll. 8-12). In light of the above findings, we are unpersuaded by Appellants' argument.

Appellants' argument that using Ito's lower viscosity material in Nanto's dispenser nozzle would render the method unsatisfactory for its intended purpose is unpersuasive for two reasons. First, as noted above, we determined that Nanto's disclosure is merely cumulative to Ito's disclosure. Accordingly, we do not find that Nanto's disclosure is necessary for the viability of the combination of Okumura in view of Ito.

Second, even if Nanto's disclosure is included as part of the combination of Okumura's method of plasma display with Nanto's nozzle dispenser (i.e., direct-writing tool) and Ito's lower viscosity and ink-jet deposition method, we determine that Nanto discloses that the paste viscosity is an important consideration (Nanto, col. 6, ll. 9-11). In fact, Nanto even discloses that the "paste" may be in liquid form (i.e., a lower viscosity) (Nanto, col. 11, ll. 16-26).

Accordingly, we do not view the combination of Ito's lower viscosity for the phosphor coating with Nanto's nozzle dispenser as rendering Nanto's deposition method unsatisfactory for its intended purpose. Rather, we determine that Nanto's disclosure actually suggests using a lower viscosity material (i.e., a liquid) such that one of ordinary skill would have tailored the nozzle dimensions and coating viscosity to successfully deposit such a lower viscosity material. *KSR*, 127 S. Ct at 1742.

For the above reasons, we determine that the Examiner properly concludes that it would have been obvious at the time the invention was made to combine Ito's lower viscosity for the coating containing phosphor particles and ink-jet deposition method with Okumura's method of making plasma display panels.

We add that it would have been obvious to modify Okumura's method of making plasma display panels with Ito's lower viscosity for the phosphor coating composition and ink-jet deposition method useful for depositing phosphor coatings in plasma display panels because such is merely the predictable use of prior art elements (i.e., a coating material having a suitable viscosity and an ink-jet method) according to their established functions (i.e., depositing a phosphor coating on a component of a plasma display panel). *KSR*, 127 S. Ct at 1740.

For the above reasons, we sustain the Examiner's § 103 rejection of claims 12-16, 19, 25-27, 29, and 39 over Okumura in view of Nanto and Ito.

CLAIMS 24, 41, AND 42

Appellants make the same arguments with regard to claims 24, 41, and 42 as were made regarding claim 12 (Br. 10-12). With regard to claim 24, Appellants additionally argue that Okumura, Nanto, or Ito do not disclose forming pixels (Br. 10-11). With regard to claims 41 and 42, Appellants further argue that the Examiner has not demonstrated how Okumura's paste as modified by Ito and deposited using Nanto's device includes the deposition of spherical phosphors using an ink-jet device (Br. 11-12). Appellants additionally argue with regard to claims 41 and 42 that

the Examiner has not established why it would have been obvious to substitute an ink-jet device for Nanto's apparatus (Br. 11-12).

We have considered all of Appellants' arguments and are unpersuaded for the reasons below.

With regard to the claim 12 arguments now made regarding the Examiner's § 103 rejection of claims 24, 41 and 42, we are unpersuaded for the same reasons provided above with regard to our discussion of claim 12.

Regarding claim 24, Appellants' pixel argument is contrary to the explicit disclosure of Nanto and the implicit disclosure of Okumura. Nanto discloses that the red, green and blue phosphor lines (i.e., subpixels) together form a pixel in the plasma display structure (Nanto, col. 1, ll. 17- col. 3, ll. 53-58). Okumura discloses a plasma display structure that is identical to that disclosed by Nanto, such that Okumura inherently discloses that each of the red, green and blue phosphor particle lines together form a pixel. Ito is not cited by the Examiner as disclosing pixel formation. Rather, the Examiner relies on Nanto's and Okumura's disclosures of pixel formation. Accordingly, the pixel claim feature is disclosed by the Examiner's combination of references.

Regarding claims 41 and 42, Okumura discloses using substantially spherical phosphor particles (Okumura, col. 4, ll. 15-18). As noted above with regard to claim 12, Okumura recognizes the importance of lowering the viscosity of the coating composition by using the substantially spherical phosphor particles and Ito discloses many benefits to using an ink-jet deposition method over conventional prior art deposition methods (e.g., screen printing or photolithography).

Therefore, contrary to Appellants' spherical particle and ink-jet device arguments, one of ordinary skill in the art would have been motivated to use Ito's ink-jet method and lower the viscosity of Okumura's paste having substantially spherical phosphor particles to permit the ink-jet deposition of Okumura's composition containing substantially spherical particles. One of ordinary skill in the art would have properly determined a suitable viscosity and equipment size to successfully ink-jet deposit the paste. *KSR*, 127 S. Ct at 1740 ("A person of ordinary skill is also a person of ordinary creativity, not an automaton.").

Moreover, as noted above, we find that Nanto's disclosure of a direct-write tool is cumulative to the direct-write tool (i.e., ink-jet apparatus) disclosed by Ito. Accordingly, we are unpersuaded by Appellants' argument that no motivation has been shown for combining Ito's ink-jet apparatus with Nanto's direct-write tool. As we view the Examiner's rejection, the combination of Ito's ink-jet apparatus and lower viscosity coating material with Okumura's method of depositing phosphor layers to make plasma display panels is the relevant combination. As noted above, Ito provides motivation for the combination of the ink-jet apparatus with Okumura's method of making plasma display panels.

For the above reasons, we sustain the Examiner's § 103 rejection of claims 24, 30-38, and 40-42 over Okumura in view of Nanto and Ito.

DEPENDENT CLAIMS 17 AND 18

The Examiner indicates in the rejection of claim 17 (i.e., apparent density) and claim 18 (i.e., hollow particles), that the densities and the

particles being hollow are result-effective variables which would have been optimized through routine experimentation (Ans. 5).

Appellants argue that the Examiner has not established that the prior art recognized the densities or the particles being hollow as result-effective variables, such that determining an optimum value of the variable would not have been obvious (Br. 12-13). We agree.

Only art recognized result-effective variables may be optimized. *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977).

The Examiner merely states it is the Examiner's position that the densities and the particles being hollow are result effective variables (Ans. 5). However, the Examiner has not established that the art recognized these variables to be result-effective variables such that the variables may be optimized.

Accordingly, we do not sustain the Examiner's § 103 rejection of claims 17 and 18 over Okumura in view of Nanto and Ito.

DECISION

We sustain the Examiner's § 103(a) rejection of claims 12-16, 19, 24-27, and 29-42 over Okumura in view of Nanto and Ito.

We do not sustain the Examiner's § 103(a) rejection of claims 17 and 18 over Okumura in view of Nanto and Ito.

The Examiner's decision is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART

tf/ls

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